

Example #7: The magnitude of the \perp magnetic field through a 50 turn loop of wire changes from zero to 2.0 Wb/m^2 in 0.20 seconds. The radius is 0.40 m and its electrical resistance is 5.0Ω .

- Determine the magnitude of the average emf.
- Find the current in the loop.
- Determine the direction of the induced current in the loop if the loop is in the plane of the paper and the magnetic field is directed out of the paper.

$$\begin{aligned} a) \Delta \phi &= A \Delta B \\ &= \pi (.40)^2 (2.0) \\ &= 1.0 \text{ Wb.} \end{aligned}$$

$$N = 50$$

$$t = .20 \text{ s}$$

$$\mathcal{E} = -50 \frac{(1.0)}{.20} \quad \boxed{\mathcal{E} = -250 \text{ V}}$$

$$b) R = 5.0 \Omega$$

$$V = \mathcal{E} = IR \quad 250 = I(5)$$

$$\boxed{I = 50 \text{ A}}$$

c) Since B increases out-of-page from 0 to 2.0 T , a cw current will produce a magnetic field into the page to oppose this increase.